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Binding gel characterization of alkali-activated binders based on palm oil fuel ash (POFA) and fly ash

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Abstract

Pastes of palm oil fuel ash (POFA) and fly ash geopolymer activated with sodium hydroxide (NaOH) and combination of NaOH with sodium silicate (Na_2SiO_3) were prepared and cured at 80 °C for a duration of 7, 28, and 90 days. The hydrated binding gel products were studied on phase, morphology, and bonding characterization. From these analyses, calcium–sodium–silicate–hydrate (C/N–S–H) gel type appear to form in sole POFA binder but at a very low Ca/Si ratio, while sole fly ash geopolymer binder consists of sodium–alumina–silicate–hydrate (N–A–S–H) binding gel product with a significant Na/Si ratio, regardless of activator types. When both precursors were used, a combination of both gel types was formed, however, Fourier transform infrared spectroscopy and energy-dispersive X-ray analyses show that the N–A–S–H gel is a more dominant product in the binder compared to the C/N–S–H gel.

Keywords:

geopolymeralkali-activated binderpalm oil fuel ashfly ash